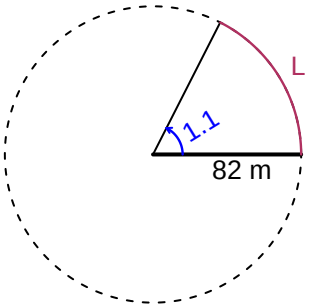
Name: Date:

Trig Final (SLTN v633)

- You should have a calculator (like Desmos) and a unit-circle reference sheet.

Question 1

In the figure below, we see a circle and a central angle that subtends an arc. The angle measure is 1.1 radians. The radius is 82 meters. How long is the arc in meters?

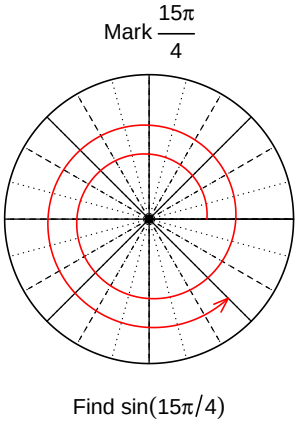


$$\theta = \frac{L}{r} \qquad r = \frac{L}{\theta} \qquad L = r\theta$$

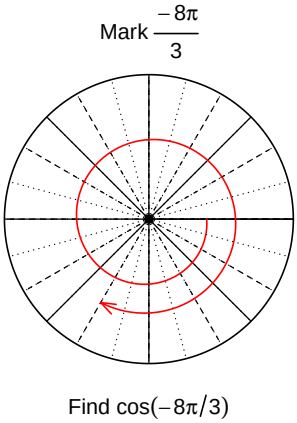
$L = 90.2$ meters.

Question 2

Consider angles $\frac{15\pi}{4}$ and $\frac{-8\pi}{3}$. For each angle, use a spiral with an arrow head to **mark** the angle on a circle below in standard position. Then, find **exact** expressions for $\sin\left(\frac{15\pi}{4}\right)$ and $\cos\left(\frac{-8\pi}{3}\right)$ by using a unit circle (provided separately).



Find $\sin(15\pi/4)$



Find $\cos(-8\pi/3)$

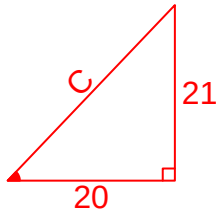
$\sin(15\pi/4) = \frac{-\sqrt{2}}{2}$

$\cos(-8\pi/3) = \frac{-1}{2}$

Question 3

If $\tan(\theta) = \frac{-21}{20}$, and θ is in quadrant II, determine an exact value for $\sin(\theta)$.

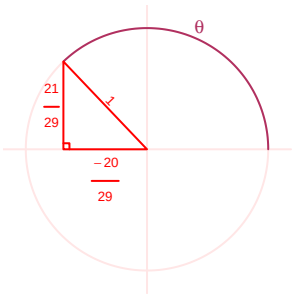
Ignore any negatives and the quadrant, and draw a right triangle (based on SOHCAHTOA) in standard (quadrant I) orientation.



Solve the Pythagorean Equation

$$20^2 + 21^2 = C^2$$
$$C = \sqrt{20^2 + 21^2}$$
$$C = 29$$

Rescale the triangle so the hypotenuse is 1. Reflect the triangle into Quadrant II in a unit circle.



$$\sin(\theta) = \frac{21}{29}$$

Question 4

A mass-spring system oscillates vertically with a frequency of 8.48 Hz, a midline at $y = -4.95$ meters, and an amplitude of 2.9 meters. At $t = 0$, the mass is at the midline and moving down. Write an equation to model the height (y in meters) as a function of time (t in seconds).

Any of these equations would get full credit.

$$y = -2.9\sin(2\pi 8.48t) - 4.95$$

or

$$y = -2.9\sin(16.96\pi t) - 4.95$$

or

$$y = -2.9\sin(53.28t) - 4.95$$